

Radiological cleanup standards and the USEPA PRG Calculator Hunters Point Naval Shipyard, San Francisco, California

In December, 2016, EPA updated its Preliminary Remediation Goal (PRG) Calculator for radiological contamination. The User's Guide for the PRG Calculator recommends using site-specific factors for a realistic scenario for exposure. On February 3, 2017, EPA Health Physicist Lyndsey Nguyen entered the concentrations for the Hunters Point Naval Shipyard Radionuclides of Concern (RoC's) at the 2006 Action Memo release criteria, which were adopted by all the RODs as Remediation Goals (RG's). Below is a table showing risks for all Hunters Point Naval Shipyard RoC's from the current RG's for future use scenario as described below. All of following risks fall within the NCP risk range of 10^{-4} to 10^{-6} . In addition, this table also shows calculated Preliminary Remediation Goal concentrations that would be associated with a 10^{-4} risk in the same realistic scenario.

Residential use PRGs for Soil, Site-Specific realistic scenario Hunters Point Naval Shipyard, San Francisco, CA

Isotope	Preliminary Remediation Goal (PRG) (pCi/g) at 10^{-4} risk	Total Risk at ROD RGs
*Secular Equilibrium PRG for Am-241	7.16E+00	1.90E-05
*Secular Equilibrium PRG for Co-60	1.14E+00	3.16E-06
*Secular Equilibrium PRG for Cs-137	5.65E+00	2.00E-06
*Secular Equilibrium PRG for Eu-152	2.63E+00	4.94E-06
*Secular Equilibrium PRG for Eu-154	2.43E+00	9.46E-06
*Secular Equilibrium PRG for H-3	-	-
*Secular Equilibrium PRG for Pu-239	6.21E+00	4.17E-05
*Secular Equilibrium PRG for Ra-226	1.69E+00	5.90E-05
*Secular Equilibrium PRG for Sr-90	7.46E+02	4.43E-08
*Secular Equilibrium PRG for Th-232	1.24E+00	1.36E-04
*Secular Equilibrium PRG for U-235	6.21E+00	3.14E-06
Total Risk if all Radionuclides of Concern were present at RG levels in same location		2.78E-04

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For each radionuclide, the following parameters were determined to be the most realistic scenario for calculating the above risk values:

1. The Durable Cover can be 2 feet of soil, 6" of asphalt, or a building foundation. (See attached relevant excerpts from the Parcel B RD). Attached are Lyndsey's calculations

showing that a 6" thick asphalt cover has equivalent gamma shielding to a 25 cm soil cover. The PRG calculator only allows entries in 10 cm increments, so she entered 20 cm, which may be roughly equivalent to 4.8" asphalt cover, to be conservative.

2. Residential scenario in which the resident lives in a home that has a generic default building foundation on top of that 4.8" thick asphalt cover.
3. Zero inhalation due to the durable cover
4. Zero ingestion of homegrown produce due to the institutional control prohibition
5. A survey unit is up to 1,000 m². Section 4.10.5 of the Users Guide states: "The RAGS/HHEM Part B model assumes that an individual is exposed to a source geometry that is effectively an infinite slab. The concept of an infinite slab means that the thickness of the contaminated zone and its aerial extent are so large that it behaves as if it were infinite in its physical dimensions. In practice, soil contaminated to a depth greater than about 15 cm and with an aerial extent greater than about 1,000 m² will create a radiation field comparable to that of an infinite slab. (U.S. EPA. 2000a)" (Lyndsey noted, however, "when I ran the calculator with 10,000 m² for ACF [area correction factor] and changed it to the maximum, I got different results.") To ensure that an infinite plane is taken into account in the risk calculations, a 1,000,000 m² ACF was used.

Here's the link to the PRG Calculator Users Guide with details: https://epa-prgs.ornl.gov/radionuclides/prg_guide.html. Attached is the PRG run that shows risks from exposures to individual radionuclides in secular equilibrium at the concentrations of the current RG's. In a particular survey unit, EPA uses the current version of the PRG Calculator to estimate the combined risk of residual concentrations of all radionuclides of concern (ROC's) to arrive at a total risk, which is then compared to the NCP risk range. The above table shows that even if all Radionuclides of Concern at the Hunters Point Naval Shipyard were present within a single location, the combined risk would be 2.78 E-4. As a practical matter, usually a given survey unit contains two to four Radionuclides of Concern, so the total risk would fall below this level.

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